10/12/89

president of Professional Engineering Associates.

The cracks appear to be the result of problems with welding materials and technique and stress concentrations in the girders at the toe of the field welds. A design error is unlikely at this location, Kapp says, because "none of our calculations indicate the flange was overstressed from a theoretical standpoint."

The consultants, working with Lehigh University steel specialist John Fisher, plan to remove the cracked areas, probably with a 6-in.-dia. hole saw, and send them to Lehigh's laboratory for analysis.

Meanwhile, engineers, school officials and Fluor Daniel Inc.—the firm selected to repair the arena—are investigating possible ways to repair the cracks. ■

ENVIRONMENT

Drop-in substitutes for CFCs are elusive, researchers say

Finding a replacement for ozone-depleting chlorofluorocarbons that can be directly substituted for CFCs in refrigeration, air conditioning and foam insulation is beginning to seem an insurmountable task, said researchers at a recent CFC Technology Conference in Gaithersburg, Md.

Leading replacements are not suitable as "drop-ins" because of their flammability and toxicity, their tendency to corrode plastics and metals, and their lack of solubility with lubricants. Manufacturers warned that substitutes would best be used in new, yet-to-be-developed equipment. Extensive field retrofitting may be required to use the new fluids in existing chillers, commercial refrigeration equipment and insulation, and the cost could be hundreds of millions of dollars.

"It's very difficult to find a substitute you can drop in and get the same performance," said Floyd C. Hayes, manager of thermal systems technology at the Trane Co., La Crosse, Wis., a manufacturer of centrifugal compressors for large air conditioning systems. Hayes said that 90% of the 100,000 systems installed worldwide use CFCs now being phased out. "I would say that field replacement is very expensive and will result in lower performance. It is not recommended," he said.

Conference. More than 400 professionals attended the conference, held at the National Institute of Standards and Technology (NIST). The event was cosponsored by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

For decades, CFCs were viewed as something of a miracle substance by contractors, HVAC vendors and building owners because of their characteristics of safety, performance, reliability and energy efficiency. A phaseout of five CFCs that scientists say are the most damaging to the ozone layer—CFC-11, 12, 113, 114 and 115, began in July under the Montreal Protocol (ENR 6/8 p. 8). Production of the compounds will be cut by 50% by 1998, and experts expect CFCs to be phased out entirely by 2000.

Research. Chemical companies such as ICI Chemicals & Polymers Ltd., the Du Pont Co., Pennwalt Corp. and Allied-Signal Inc. have intensified research and development efforts and announced building programs for plants to manufacture substitutes. Last week, ICI Americas Inc., Wilmington, Del., said it had selected a 92-acre site

CFC alternatives have warming impact

Refrigerant	Ozone depletion potential	Global warming potential
CFC-11	1.0	1.0
CFC-12	0.9-1.0	2.8-3.4
CFC-113	0.8-0.9	1.3-1.4
CFC-114	0.6-0.8	3.7-4.1
CFC 115	0.3-0.5	7.4-7.6
HCFC-22	0.04-0.06	0.32-0.37
HCFC-123	0.01-0.02	0.02
HFC-134a	0	0.24-0.29
HCFC-141b	0.07-0.11	0.08-0.10

Source: United Nations Environment Program draft report

Figures indicate the oxygen depletion potential and global warming potential of commonly-used substances compared with those of CFC-11, assigned the base value of 1.

in St. Gabriel, La., to build a $100-million plant to produce alternative fluorocarbon 134a.

Currently, researchers said, the most likely replacements for CFC-11—used as a blowing agent for rigid polyurethane insulation—are HCFC-123 and HCFC-141b. To replace CFC-12, used in residential refrigerators and car air conditioners, HFC-134a may be the best choice. HCFC-22, already in use in air conditioning and refrigeration systems, is another possible substitute.

In addition to compatibility concerns, researchers said they are studying the effect those CFC substitutes may have on global warming, or the greenhouse effect, which occurs when atmospheric gases reflect ultraviolet radiation rising from the earth's surface. CFCs are responsible for about 10 to 15% of the greenhouse effect. Now fearful that legislation or international agreement may eventually restrict substances on the basis of their global warming potential, researchers are taking it under consideration as they search for CFC substitutes.

"The danger is you jump from the frying pan into the fire by picking something with a good ozone characteristic but a harmful greenhouse effect," says David D. Didion, head of the thermal machinery group in the Center for Building Technology at NIST. "Global warming is now as much of a concern as ozone."

Kent Anderson, chairman of ASHRAE's CFC committee, said he believes the impending replacement of CFCs will result in increased expenses for building owners and may lead to shortages and delays. "We are going to have to pay a lot more attention to operation and maintenance," says Anderson. "Everybody with an air conditioning system in a building is going to have to deal with this." ▣

By Virginia Kent Dorris

POWERPLANTS

AID to support studies for private foreign jobs

The Agency for International Development is requesting expressions of interest from private power developers, contractors and others who want to participate in a new program. It will promote privately-developed energy production, conversion and transmission projects in AID-assisted countries, numbering about 50.

AID's Private Sector Energy Devel-

ENR NEWS IN BRIEF

Hospital mortgage—Boston City Hospital is applying for federal mortgage insurance, becoming the first city-owned hospital to do so since the government amended the program to include hospitals in 1983. City officials want to demolish four of the hospital's existing buildings and replace them with a 10-story tower. The officials are hoping to obtain inexpensive money for the $170-million program by issuing bonds backed by the federal government's credit rating.

Providence design—Two architects were named design team winners last month for a mixed-use complex in downtown Providence, R.I., that would include a convention center with 350,000 to 400,000 sq ft, a 300-room hotel, a 19-story office building and a 1,680-car garage. The hotel, office building and garage are being designed by the Boston office of Cannon, with Marshall Contractors Inc., Rumford, R.I., as contractor; the convention center is being designed by the Boston office of Howard Needles Tammen & Bergendoff, with Providence-based Gilbane Building Co. as contractor.

Capital shortfall—The Washington, D.C., area faces a big transportation funding shortfall—$20 billion to $30 billion through fiscal 2010—according to the Metropolitan Washington Council of Governments. More than half the total would be in construction or rebuilding, says Ron Kirby, the council's transportation planning director. A recent council draft report says that "summarizing" current plans and programs indicates that a twofold to threefold rise in spending is needed. The report says future housing development will move farther from downtown and a much better and bigger highway system is needed to avoid major congestion problems.

Prison plans—Kentucky's Corrections Cabinet, which is so short of space that nearly 1,000 state prisoners are being housed in local jails, unlocked plans last month for the construction of three new prisons. But persuading the 1990 General Assembly to fund the projects may be only slightly less challenging than breaking out of jail, so the agency will await the legislature's decision before hiring an architect. The plans call for a $40-million, 550-bed prison for men, a $35-million, 500-bed prison for men, and a $25-million, 430-bed prison for women.

Petrochemical seminar—More than 300 leaders of large construction and engineering firms will be invited to meet Nov. 5-7 in Houston with senior company executives and energy ministers from eight Asian Pacific countries. The seminar—the first Conference on Asia-Pacific Petrochemical and Refinery Integration—will deal with the energy markets in South Korea, Taiwan, Japan, Thailand, Singapore, China, Indonesia, Malaysia and India. The U.S. Trade and Development Program, which promotes U.S. exports to developing countries, is sponsoring the conference.

Belfast redevelopment—Officials in Northern Ireland are making plans for revitalizing Belfast with a $765-million redevelopment scheme. Eventually, more than 121 acres along the Lagan River may be rejuvenated through the construction of such projects as a $170-million mixed-use complex with a concert hall, a conference center, office towers and a hotel. Financial and development consulting are being provided by 3D/International Inc., Houston, and its subsidiary, Privatization Development of America Inc.

Island work—Even before Hurricane Hugo devastated the Caribbean, the U.S. Virgin Islands already had planned what reportedly is their largest-ever capital improvement program. The team of Williams-Russell and Johnson Inc., Atlanta, and deJongh Associates, St. Thomas, has been awarded a $36-million contract for program management and construction supervision services for the $370-million program. Work is expected to include schools, hospitals, housing and infrastructure.

Five-nation irrigation—The Central American Bank for Economic Integration is studying the feasibility of a $100-million irrigation, drainage and soil conservation project proposed for rural areas in five Central American countries. The program would involve drainage, irrigation canals, wells and ancillary works in Costa Rica, Nicaragua, Honduras, El Salvador and Guatemala.